Game Changing Development

Hypersonic Inflatable Aerodynamic Decelerator (HIAD)

Completed Technology Project (2011 - 2015)

Project Introduction

Develop an entry and descent technology to enhance and enable robotic and scientific missions to destinations with atmospheres. The Hypersonic Inflatable Aerodynamic Decelerator (HIAD) project will focus on the development and demonstration of hypersonic inflatable aeroshell technologies suitable for an ISS down-mass capability. The project will focus on the completion of an IRVE 3 development flight test and other necessary analysis and ground-based testing. The key technologies include flexible TPS materials for hypersonic entry conditions, attachment and inflation mechanism and high-strength, lightweight, inflatable bladder materials capable of withstanding high temperatures. The HIAD Project is developing a truly crosscutting technology for atmospheric entry. This technology enhances, and potentially enables, a variety of proposed NASA missions to destinations with atmospheres (Mars, Venus, Titan, the gas giants). This holds true for returning payloads to Earth from Low Earth Orbit (LEO) and beyond, such as ISS down mass or sample return capsules. Not only is this technology applicable to robotic vehicles, the technology is envisioned to be scalable to crewed missions (to Mars or Earth return). The HIAD Project is orchestrating a series of ground and flight tests to demonstrate the viability of thermal resilient materials manufactured in robust configurations to withstand the extreme structural and thermal environments experienced during atmospheric entry. Benefits of using the inflatable decelerator design includes mission flexibility provided by the minimal volume and mass requirements to transfer the stowed HIAD to its destination, as well as increased landed mass, accuracy, and altitude in a variety of space applications.

Anticipated Benefits

100% increased payload mass (8-10 meter class 2 metric ton) 50% increase in payload mass fraction Access to 90% of Mars surface (Southern Highlands) Eliminates launch shroud constraint (currently approximately 4.5m) on aeroshell diameter

Hypersonic Inflatable Aerodynamic Decelerator

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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

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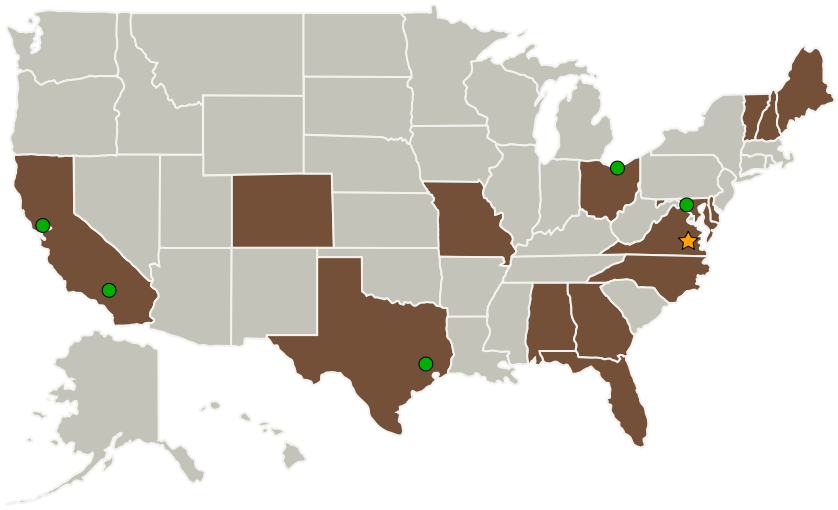
Primary U.S. Work Locations and Key Partners



Project Management

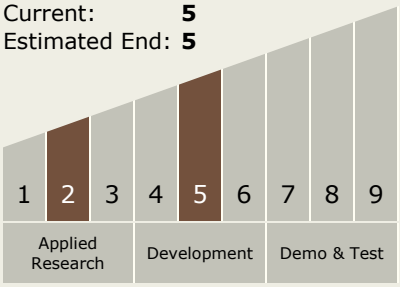
Program Director:
Mary J Werkheiser

Program Manager:
Gary F Meyering

Principal Investigator:
Michelle M Munk

Technology Maturity (TRL)

Start: **2**
Current: **5**
Estimated End: **5**



Target Destinations

Earth, Mars

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Organizations Performing Work	Role	Type	Location
★Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia
Airborne Systems North America of CA, Inc.	Supporting Organization	Industry	
●Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California
●Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California
Aspen Aerogels, Inc.	Supporting Organization	Industry	Northborough, Massachusetts
Duke University	Supporting Organization	Academia	Durham, North Carolina
Georgia Institute of Technology-Main Campus(GA Tech)	Supporting Organization	Academia	Atlanta, Georgia
●Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio
●Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland
ILC Dover	Supporting Organization	Industry	Newark, Delaware
●Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas
Lockheed Martin Space Systems(LMSS)	Supporting Organization	Industry	Sunnyvale, California
National Institute of Aerospace	Supporting Organization	Academia	Hampton, Virginia
Oceaneering Space Systems	Supporting Organization	Industry	

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Organizations Performing Work	Role	Type	Location
The Boeing Company(Boeing)	Supporting Organization	Industry	Chicago, Illinois
University of Maine	Supporting Organization	Academia	Orono, Maine
University of Vermont	Supporting Organization	Academia	Burlington, Vermont

Primary U.S. Work Locations	
Alabama	California
Colorado	Delaware
Florida	Georgia
Maine	Maryland
Missouri	New Hampshire
North Carolina	Ohio
Texas	Vermont
Virginia	